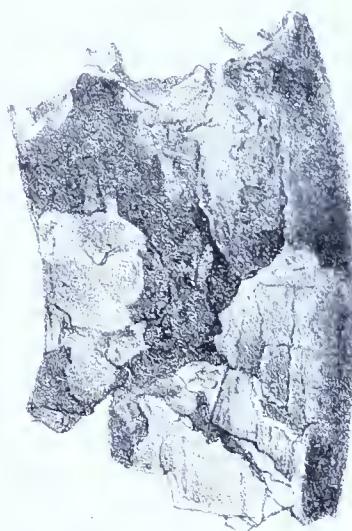




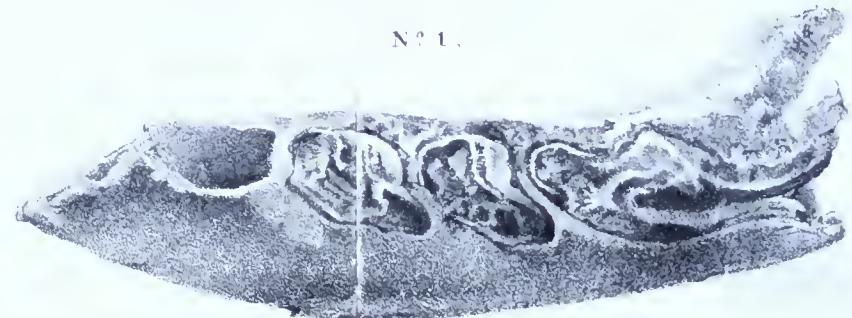
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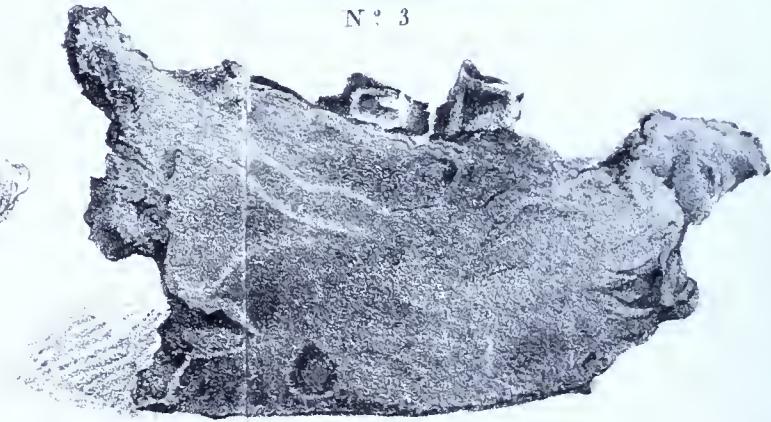
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AN EPITOME OF THE PROGRESS OF NATURAL SCIENCE.*

IF, on opening the great subject to which we are about to draw the attention of our readers, we begin with periods scarcely within the historical records of our race, it is not with a view to enter upon any controverted points in the history of mankind, but in order to revive some recollections of the progress of the human mind, that our readers may pursue with us, in a more satisfactory manner, the history of the progress of natural science, and more especially of Geology.

Geological information, is very important to the study of the antiquity of human society; for opinions, which to a certain extent have been established, would by many be considered vague and transitory, did not geology by its own monuments, which may claim to be called indestructible, give substance to the traditions of our earliest periods, and confirm the great event from which they spring, and which we even find recorded in a volume, which has been consecrated by the veneration of so many generations.

The exaggerated accounts of the great antiquity of the Chinese and Egyptians, which at one time were put forth with so much confidence, and which were so much at variance with chronology, have been reduced to insignificance, by the penetration and assiduity of minds more learned and faithful than those which preceded them. The zodiacs, painted on the walls of the

* It will not be expected that this rapid and imperfect sketch should contain references to authorities. It would look pedantic to refer to ancient authorities, when so many popular modern works are at hand, to enable the reader either to pursue the events of these ancient periods more in detail, or to verify them. The writer has mainly adopted the reasonings of Cuvier, and in many instances has made them the basis of his paper.

temples of Egypt, and which, it was asserted, contained proofs of a refined cultivation of astronomical science by the Egyptians, at periods that mock our chronologies, have been stripped of their romance. The most authentic notices we have of the existence of astronomical knowledge, do not date beyond the eighth century before Christ. The occultation of the heavenly bodies, we may of course expect to find recorded to some extent, by ancient nations sufficiently advanced in civilization, to have invented the means of transmitting the memory of great events. The geographical situation of some of those nations was favourable to the introduction of astronomical observation, and some secular periods had been ascertained with sufficient precision, to have in some manner justified the inferences which have been drawn, of a supposed high state of astronomical knowledge. But in those early stages of society, this could have been accomplished only by miraculous interference, for the appropriate means of measuring time and space, were not alone wanting ; the application of terrestrial mechanics to celestial motions, by such means, was equally essential. A vicious and hypothetical system of celestial dynamics, independent of physical laws, had, until the period of Pythagoras, limited the astronomical knowledge of the ancients, to observations unconnected with philosophical theory : and indeed, it was not until the time of Bacon, that the real foundations of natural science were laid. He first taught mankind how to trace nature through all her laws, in order to use our knowledge of her power, for the highest purposes.

We shall now proceed to speak of four great nations, of whose existence we have historical proof fifteen hundred years before Christ. The Indians, the Chinese, the Babylonians, and the Egyptians. The Chinese, in whose favour such extravagant pretensions were set up, appear to possess no authentic observation of a greater antiquity, than an eclipse observed in the eighth century before Christ. Neither does any astronomical observation made by the Chaldeans at Babylon, date farther back. Thus, although we have satisfactory evidences that those people existed as powerful and independent nations, seven hundred years before the date of these astronomical records, yet we cannot safely date the origin of science, before the eighth century preceding the christian era. Having thus reduced within reasonable bounds, the period of the first dawning of astronomy, the

most obvious of the sciences, we naturally inquire how far that period is consistent with the most ancient historical notices of the origin of society. And here we observe a remarkable agreement in the records of two of those nations. The Hebrew text in Genesis, according to the most received chronology, giving 2349 years B. C., as the period of a great deluge which almost extirpated every living thing from the face of the earth, and the Chinese records assigning the period of 2384 years B. C., to the same event. It was about that period Confucius, their philosopher, represents their first king Yao, as occupied in draining the waters which had ascended to the tops of the mountains. So that if we consider this as the last period when the earth submitted to the mastery of the waters, we find a period of about fifteen hundred years, to assign to the renovation of the human race, before man became sufficiently civilized to note the occultation of the heavenly bodies. It is to be remarked, that the earliest notices we have of the great nations that have been mentioned, represent them as settled on extensive plains of great fertility, capable of affording them abundant subsistence, and intersected, as they were, by navigable streams, of exchanging their commodities with distant settlements, and thus laying a foundation for commercial habits. Such has at all times been the discriminating providence of man; congregating upon the fertile alluvial soils of the great drainages of the country, and rejecting his surplus population, upon the less productive lands of greater elevation. The Indians were thus settled on the rich plains of the Ganges; the Babylonians on the Delta of the Euphrates; the Egyptians along the banks of the Nile. But the elevated sandy plains, to the flanks of which these alluvial soils extended, were the homes of an unquiet pastoral people, whose continual irruptions were fatal to the arts of peace. We find the early history of China agitated by the invasions of the Tartar hordes; that of India by the Mongols; of Babylonia by the Assyrians, and of Egypt by the people of the Shepherd Kings, from whose dominion she was redeemed by Sesostris. When we remember how effectually science and literature were oppressed, by the irruption of the same barbarous nations into Europe, towards the close of the Roman empire, we can imagine how fatal the effects of similar movements must have been, upon the first dawnings of social improvement. We find here a sufficient cause for the

protracted advancement of science, the influence of which will be still more apparent, when we come to observe how steadily the light of natural knowledge burnt, when it was removed beyond the current of these adverse circumstances. Strong as was this current, and unfriendly to historical accuracy, we still find the antiquity of society asserted, in various records of a remarkable character ; such as the sacred books of the Hebrews ; the Vedas, or sacred books of the Brahmins ; the U King, or five books of the Chinese ; and the Institutes of Menu, the sacred volume of the Hindoos. The Indians have not, properly speaking, any historical book. The Vedas contain an exposition of the religious philosophy of the Brahmins, written in the Sanscrit tongue, now a dead language. It appears to have been the policy of the Brahminical caste, to have kept back the knowledge of historical truths, and to have substituted in their place, metaphysical speculations. In all times, the people of India seem to have submitted to that caste, as the sole depository of all knowledge, sacred and profane. It was so in the most ancient times, and their religion, laws, and customs, are at this day, such as Alexander of Macedon found them.* Their mythology, their metaphysics, they imparted to other nations, but the Indians never had an advanced astronomy, nor a regular geometry.

In estimating the relative antiquity of the nations we have spoken of, there are four circumstances worthy of attention.

1. The remarkable agreement between all the known written languages, and the Sanscrit.

2. The great height of the Himmaleh mountains, the loftiest on the face of the earth. Javaher in Thibet, rises to an elevation of 25,745 feet, which is 500 feet more than Sorata, in the Andes of Quito. Mr. Gerard found the Tartars living on the table lands between the peaks of the Himmaleh, with their horses, dogs, and domestic animals, at a height of near 16,000 feet. Herds of yaks and goats browse in the still more elevated acclivities, where theorists have supposed eternal snows to reign, the limit of which was found not to be under 20,000 feet. A legitimate inference to be drawn from these facts, is, that the human family might have found a safe refuge here, when the plains of Babylon and Egypt were under water.

3. The tenderness among those ancient people, of animal life,

* 324 years B. C.

and aversion to dead bodies, even to skins of animals, at this day: as though their ancestors had known a period, when the very scarcity of animal life, had made it impious in their eyes to destroy it.

4. The evidence we have that the religion of Egypt was derived from Ethiopia, or upper Nubia; and that civilization originally came into Nubia, from India.

The fanciful cosmogonies which are found in many of those ancient records, appear to have sprung from the theoglico-metaphysical studies, common to those ancient people. In all of them we find a surprising coincidence, as to the occurrence of a great deluge. In the institutes of Menu, which date, according to Sir William Jones, about nine hundred years B. C., the account of the creation of the world by an omnipotent being, is made—in a passage bearing a close resemblance to the analogous passage in Genesis—to occupy a period of six days; but the construction given to the word *day*, makes it equivalent to a period of several thousand years. These coincidences show, that the human mind, in those distant ages, and in regions so far apart, by thus cherishing the memory of traditions with scarce a difference of character, has done much to give to them the weight of historical truths; and the geological phenomena, which coincide so remarkably with those traditions, sustain the assertion we have before made, that geological knowledge is important to the satisfactory study of the antiquity of human society. We are far from seeking to reconcile the Mosaic and Hindoo narrations of creation, by considering the days as so many secular, instead of solar periods; the Hindoo construction is to be rejected as irrational to the judgment of common sense: for whether men choose to consider the sabbatical institution, as ordained for sanctification, or for relaxation from labour, it has one general character in our scriptures, about which we cannot dispute: it is a seventh part of the whole period, and the notion of praying or preaching, or abstaining from all kinds of labour, for a period equal to several thousand years, is an absurd hypothesis. To rest from labour one natural day in seven, is a convenient custom, grateful to the physical condition of man, and sanctioned by all civilized nations.

In relation to the Egyptians, the great antiquity which was once attributed to them, is no longer admitted. The long list of their kings, which Eusebius, the bishop of Cesarea, has preserved

in the fragments of Manetho and Berossus, and by means of which it was endeavoured to strike the roots of their history so deep into time, has been reconciled to our established chronologies. Instead of succeeding each other regularly, as it was pretended they had done, it appears that Egypt was divided, as England was in the time of the heptarchy, into independent states, and that the series was a contemporaneous one. The sacred books of Hermes, together with all the Egyptian books, are lost, and all that we know of the science and history of the Egyptians, is from the Greeks: for as the Egyptians had drawn their knowledge from India, through Ethiopia; so, the Greeks, to whom Europe and America owe so much, derived their knowledge from Egypt. It appears, however, that their sacred books, which were carried in procession before the priests, treated of almost every subject they were acquainted with, except their history. In this they resembled the Indians, as well as in the exclusive appropriation, by the priesthood, of all learning, sacred and profane.

In one very important particular, however, the Egyptians differed from the Indians, and this difference was favourable to science. The Ethiopians, from whom the Egyptians derived their religion, whilst they retained the impression the ancient Indian colonies had made upon them, had incorporated with this higher stage of civilization, their ancient usages, such as were peculiar to the hunter state, and which yet distinguish the Indian tribes on this continent. In what precise manner the respect paid to animals, originated in Ethiopia, we know not; nor whether their tribes were named, or not, after particular animals; but it does appear that the Egyptian priests attached a particular animal to each divinity. Thus the crocodile was consecrated to Saturn; the cow to Ibis; the hawk to Osiris; the dog to Anubis &c. The veneration paid to their deities, was extended to the animals associated with them, and which were brought up in the temples in which the deities were worshipped. Many of the emblems of their religion were borrowed from the animal kingdom: with such favourable opportunities of observing the external forms and the habits of animals, a foundation for natural history was insensibly laid. A further obligation appears too, to have devolved upon them, that of embalming these animals when they died; and as it was equally the custom to embalm

human bodies after death, opportunities of observing the internal structure of animals and men, were constantly afforded. A foundation was thus laid for comparative anatomy, the which, although it never arose to a science in Egypt, must still, as an art, have been highly advanced; since the Greeks resorted to that country to study anatomy, and Galen himself went thither, for the express purpose of examining a human skeleton, imitated in bronze.*

Herodotus, when he travelled in Egypt, was told by the Egyptian priests, that the Delta, of which lower Egypt is formed, was the gift of the Nile. That river on its annual retreat, deposits a layer of mud; and it results from a geological calculation made upon these principles, that 2000 years before our era, lower Egypt was not in existence. The pyramids themselves, by Manetho's account, were constructed after Sesostris had delivered the country from the dominion of the Shepherd kings; neither did they exist at the time of the Exodus, as we have a right to suppose, since they are not mentioned in the scriptures. As the pyramids were anterior to the columnar architecture of the Egyptians, we have thus evidence, coinciding with the geological proofs, of the low origin of the Delta of Egypt, as well as of the comparative antiquity of the Egyptian nation.

During the dominion of the Shepherd kings, which lasted about two hundred years, the progress of science was necessarily retarded, as the priesthood was overthrown. Subsequent to the re-establishment of the public liberties, by Sesostris, there was a second invasion of the country by the Medes and Persians, under Cambyses, about six hundred years before Christ; but in despite of adverse circumstances, the prosperity of the Egyptians continued to increase, together with their progress in the arts. The annual inundations of the Nile, introduced not only surveying, to distinguish private property, but the digging of canals, which eventually led to a knowledge of hydraulics. The erection of their obelisks on the alluvial formations, shows that their acquaintance with mechanics was very extensive; and the reliefs and intaglios upon these monuments, and the precious stones worked by them, evince a perfection in the art of stone cutting, which has never been surpassed. Hence we infer a knowledge of the art of tempering metals. Specimens of bronze and gold have been found in their tombs, sometimes representing with

* 445 years B. C.

great fidelity the animals they were familiar with. Their forms too, are reproduced in a very perfect manner, both in their sculpture and paintings. More than fifty species of animals are represented with such truth, as to be immediately recognized by naturalists. In one painting, representing people fishing, more than twenty species of fish, peculiar to that country, are depicted with similar fidelity. Of their physical and metaphysical theories, enough remains to convince us, that they were a most ingenious and philosophical people. One fiction of their mythology was raised upon the analogy nature presents, in producing organized animals from the egg. This planet was supposed by them to be a mundane egg, brought into life by a metaphysical principle, after the manner of incubation. They believed also in the successive destruction and renovation of the world, and if we are to believe, as we reasonably may, that the Pythagorean doctrines, as we find them sketched in Ovid's *metamorphoses*, were derived from Egypt, the Egyptians may claim to be considered as having laid the foundation of some of the most important geological truths, which have been worked out in our own times. In enouncing the following truths, Pythagoras is made, by Ovid, to speak in his own person.

“ Nothing perishes in this world; things merely vary and change their form.

“ Sea has been changed into land; marine shells lie far distant from the deep.

“ Valleys have been excavated by running water, and floods have carried the ruins of hills into the sea.

“ Islands have become connected with the main land, by the growth of Deltas, as Pharos to Egypt.

“ Peninsulas have been divided from the main land, and have become islands; according to tradition, Sicily has thus been separated.

“ Plains have been upheaved into hills, by the confined air seeking vent, as at Trœzen, in the Peloponessus.

“ The temperature of some springs varies at different periods.

“ The waters of others are inflammable.

“ Volcanic vents shift their position; there was a time when Etna was not a burning mountain, and the time will come when it will cease to burn: whether it be, that some caverns become closed up, by the movements of the earth, and others opened, or whether the fuel is exhausted.”

From the enumeration of these high attainments of the Egyptians, which, it appears from history, were peculiar to that people, we may reasonably expect, that all the vestiges of philosophy, which we find in the early history of barbarous nations, were derived from Egypt. We shall see how true this is, in relation to the Greeks, when we come to consider the period of their connection with Egypt. But we must first advert to the cosmogony of the Jewish people, preserved in so remarkable a manner, in the book of Genesis: a venerable monument of ancient opinions, where the highest propositions of natural philosophy, are occasionally treated in a manner surprisingly consistent with the present received opinions of the order of nature. In conducting our readers along the historical chain of these ancient periods, they will be struck with the proper and natural order, assigned to the details of that cosmogony. It is there stated, that after the surface of the earth was prepared, and exposed to the influence of light and heat, aquatic animals were first created, next plants, then terrestrial animals, and last of all, man, with dominion over them all. This order of succession is consistent with reason, and must have been narrated by a superior mind. Had this cosmogony been an idle invention, like some of the fanciful creations in the Vedas and Puranas, it is probable the order would have had a less natural character, and perhaps the inventor would have created the animals before their food. But here we see things luminously narrated after the true order of nature, and consistent with the most refined discoveries of geology. We must, however, remember, that Moses, to whom these ancient books of the Hebrews are attributed,* had been brought up by the Egyptian priests, and had been probably instructed by them in their arts, and their most recondite philosophy: he appears to have been in every sense fitted for the high station Providence had allotted to him, when he was constituted the deliverer, and the lawgiver of his nation.

About fifteen centuries before our era, the disturbances in Egypt caused various emigrations. Cecrops carried the mysteries of Isis, or Ceres, into Greece, and about sixty years later, Cadmus brought over from Phœnicia, the oriental alphabet, which was

* It will not escape the philologist, that the Hebrew words "Ish," a man, and "Isha," a woman, are contained in the names of the Egyptian deities, Osiris and Isis.

adopted by the Greeks, and of which the letters of the Roman alphabet, and our own, are imitations. Previous to these emigrations, science, which had originated during the Africo-asiatic period of society we have briefly glanced at, had not been able to advance beyond the sacred circle, which the priesthood had drawn around it: the Brahminical and Egyptian priests, were alike the sole depositaries of all knowledge, sacred and profane. This circle being now broken through, the human mind, released from its trammels, soon entered upon the philosophical period of the early stages of society, as contra-distinguished from the sacerdotal period which had preceded it.

(To be continued).

TOUR TO THE CAVES IN VIRGINIA.

In a letter from Dr. Richard Harlan to the Editor.

Washington, May 28, 1831.

MY DEAR SIR,—In answer to your request, to have some details of our tour through part of the state of Virginia, I think I can do no better than send you a copy of my Journal; assured that you will make full allowance for the inadvertencies occasioned by the rapidity of our progress, and the very limited time at our disposal.

I left this city, with a friend, on the 17th inst.; the bridge across the Potomac having been destroyed by ice during the winter, we were obliged to cross at Georgetown in a flat boat, and arrived at Fairfax court-house at 9 P. M. on a dark night, and over a very bad road. The principal hotel here, had recently been destroyed by fire; we succeeded, however, in getting tolerable lodgings. I was awoke during the night by the *Caprimulgus Vociferus*, (Whip-poor-will,) which perched for some time in the vicinity of my window. Thus far, this bird has appeared to us, more common in Virginia and Maryland, than in Pennsylvania: but the notes of the partridge we have not once heard; they appear all to have perished during the severe snow storm of last winter.*

* We are afraid this will be found to have been very generally the case. Our favourite retreat, Brandywine springs, in Delaware, was last year the paradise of partridges; they were abundant, and having been but little disturbed, were very confiding. But we have received sad accounts, this season, from the farmers, of their skeletons being found under the fences.—[Editor.]

Wednesday 18th. Started early, and arrived at Warrington, Fauquier County, to dinner. Dr. W. of this village, presented us with several interesting specimens of minerals and rocks, also a fossil molar tooth of an elephant, found in this vicinity. Warrington is situated on an elevated plain, from whence the views are very beautiful. Nothing could be more kind than our reception here.

Thursday 19th. Left Warrington at day-break,—roads mountainous, and in Pennsylvania would be considered very bad. It gave us pain to see so many listless, idle persons, passing their days about the taverns. Men playing at marbles like boys, and exceedingly prone to cursing and swearing. In Pennsylvania, we are not happy without some useful occupation, and our people know how to help themselves. Here the climate, and the sad burden of negro slavery, which oppresses the white man still more, have made him dependant upon others; and if a gate is to be opened, or the slightest thing to be raised from the ground, Sambo, or Governor, or Major, or Colonel, or some pseudo dignitary of the African stock, is called from his work to do it.

In approaching the Blue mountains, the hills appear to be composed of the following strata; at least we crossed them in the following succession, our route lying in a direction south of west.

1. A red sandstone: our course lay for many miles parallel to this stratum; in these parts of Virginia, it constitutes the surface rock, the disintegration of which generally forms the common soil of the country, and gives the red appearance to the newly ploughed lands. The soil bears good grain and clover.
2. Talcose rock.
3. Greenstone.
4. Slate.
5. Decomposed greenstone, or red earth, as it is called. It is of a brick-dust colour, covered with loose fragments of quartz, and is apparently the same earth in which the gold is found in Carolina and Georgia. This extreme point of the gold region displays itself here on the main road, in the vicinity of a blacksmith's shop, ten miles north of Culpepper court house, about twenty miles in a parallel line from the gold region of Spotsylvania. It rained during the short time we could dedicate to this locality, in which some slight traces of the metal were observed. We dug through several feet of this hill, and beneath the loose quartz, we observed several veins of decomposed micaceous rock, alternating with veins of quartz, both dipping at an angle of about 65° . The mica, in these glittering sands, is thought to be gold dust, by a great many of the country people.

The specimens we obtained in our researches, demonstrate that the gold region here resembles in every important particular, equivalent formations, both in S. America, and in Russia, on the east side of the Ural mountains. The true mineral structure of our gold formations, I first learned at the geological lectures you delivered in Philadelphia, this last spring.

Much rain fell, and we were exposed to a hurricane, accompanied with thunder, lightning, hail, and rain. The mountain torrents on these occasions, swell the streams, and soon render the fords impracticable. The country people not being accustomed to rely upon bridges, are careless in the directions they give to travellers, and fatal accidents frequently happen. We were upon one occasion of this kind benighted, and compelled to take refuge in the house of a respectable widow, but she received us cheerfully, and entertained us after the best manner she was able. Most of the slaves were poorly clad, whom we noticed in the fields; *some females were ploughing and harrowing*; they looked squalid, and unhappy.

Friday 20. Arrived early in the morning at Orange court-house, where we breakfasted. We deviated a little from our route, in order to pay a visit to Mr. Madison, at his seat, Montpelier. On presenting a letter of introduction from General P. we were received with true Virginian hospitality, and with a cordiality that charmed us. The farm of Montpelier is under excellent cultivation, and repair. The clover and maize crops are thriving, but the wheat fields, like most of those we have seen, have suffered from the fly. The mansion-house is in a fine position, on an extensive and elevated plain, almost mountain-locked. The distant views are very grand. The venerable patriot, dressed in the garb of by-gone days, was an object of great interest to us; his conversation was that of a very high bred man, dignified and easy, and appearing to seek information, rather than to convey it. The slaves here wore a very different aspect, from those we had before seen. Pursuing our journey, we arrived at Charlottesville, at $7\frac{1}{2}$ P. M., after a fatiguing day's journey of forty-five miles, over bad roads. After tea, we walked about a mile to the university, to pay our respects to some friends; here we met with a very pleasant society, consisting chiefly of the families of the professors.

Saturday, 21. Charlottesville is rather a superior place. It

contains good buildings, and its society is refined. Every where we found hospitality. Desiring to make a short excursion on horse-back, we discovered that all the Rosinantes were engaged by the students. Our wants, however, were no sooner known than supplied, by the polite and voluntary offers of private gentlemen. Immediately after breakfast we set out on a visit to Monticello, the seat of the late Mr. Jefferson, which is built on the summit of a high mountain, distant from Charlottesville about one mile; but in following the directions of the various windings, to graduate the ascent, it is about three miles; two mountains nearly join each other, the right hand one is called Carter's mountain, that on the left is MONTICELLO; when about two thirds up the mountain, we dismounted in the woods, at the family grave yard, enclosed by an ill-built stone wall, where lies, in obscure repose, the neglected remains of the patriot and philosopher; there are also the graves of several of the family. The whole scenery around this lonely spot, presents a gloomy and a melancholy aspect. We were informed that Mr. Jefferson requested on his death bed, (or left a note to that effect,) that all appearance of pageantry, and useless ceremony and display, should be scrupulously dispensed with, on the occasion of his funeral. He further requested, that no other memorial should be erected to his memory, than a plain, granite column, with a simple inscription, signifying his having been the author of the declaration of independence—founder of the Virginia University, &c. It appears to most strangers who visit this spot, the most unpardonable neglect, that this last request should not have been immediately attended to. We were informed at Charlottesville, that the mechanics in the vicinity, had offered to complete the work gratuitously, but as yet nothing has been effected, notwithstanding five years have elapsed since the death of Mr. J. The whole establishment of Monticello is rapidly verging toward ruin, and this splendid building, which originally cost, as we were informed, upwards of 50,000 dollars, has actually been offered for sale, together with 1,100 acres of land, for the trifling sum of \$11,000. In the hall there still stands a column of verdantique, surmounted by a marble bust of Mr. Jefferson by Ceracchi.

From the summit of this isolated eminence, the views are imitatively grand and imposing; the village to the north-west appears at the very foot of the mountain, and the university, which

lies about one mile further west, is also plainly distinguishable ; the views in these directions are then closed by the Blue mountains, forming a pleasing back ground to the picture : towards the east and south, the horizon is extended to an immense distance, and the eye is at length tired with tracing the faint outlines of the tops of receding hills and mountains. Towards the south, in Bedford county, Va., are observable two pyramids, at least eighty miles distant ; they are known as "Otter's Peaks."

On our return to Charlottesville, we again visited the university. The numerous buildings attached to it, are constructed of different orders of architecture, which, whilst they serve as useful specimens of the arts, give variety and interest to the scene. The library, situated in the Rotunda, is constructed on a large scale, and already contains many very rare and valuable works, in the various departments of literature and science, principally selected by Mr. Jefferson. The cabinet contains but few objects in Natural History of much interest, with the exception of a finely preserved head of the *Argali*, or "BIG-HORN," from the Rocky mountains, brought by Lewis and Clark ; also some bones of the Mastodon. The lower jaws of two of these have the remains of the inferior tusks, which characterize several species of this genus ; they are precisely similar to those described from an individual skull in possession of Mr. Peale of N. York, and which has been erroneously supposed to have belonged to a distinct genus of extinct fossil quadrupeds.

At 4 P. M. we took leave of our kind friends, and pursued our way to Wyer's Cave, by the road to Port Republic, and slept the same night at Coxe's, a good tavern sixteen miles from Charlottesville, close to the Blue mountain.

Sunday, 22. Recommened our journey at 7 A. M. and soon reached the base of the Blue mountains, at Rock-fish Gap, and gained the summit on foot, hammer in hand. The eastern slope of this mountain at the above named Gap, develops the following rocks. Red sandstone ; green-stone ; old red sandstone ; slate rock ; and granite ; some of these rocks run into each other, and occasion many peculiar varieties.

A fine clear view of the Alleghany mountains, is presented from the summit of this ridge. We arrived at Wanesborough at 10 A. M. This place is situated on the south branch of the Shenandoah, at the head of navigation, three miles distant from

the CAVES—it was settled by soldiers of the revolution, who received the farms as bounty lands.

Monday, 23. After an early repast, we proceeded to *Wyer's Cave*, situate on the south branch of the Shenandoah, approached by a road of difficult access; there is an iron forge a little below, and a tavern within eight hundred yards of the spot, kept by Mr. Bryant, who rents the farm on which the caves are found. The three slaves whom we had hired at Port Deposit, had preceded us, and awaited us at the entrance of the caves, furnished with tools for digging; the principal object of our visit being to ascertain if the caves contained fossil bones. The frequent descriptions I had read of this cave, had prepared me on the present occasion, to experience disappointment. The entrance is difficult of access, and dirty—the floors are constantly interrupted by precipitous risings and depressions, and by large broken masses of the limestone in which the caves occur. In some of the chambers, the floors are loaded with wet tenacious clay, and the stalactites are for the most part discoloured by the water which percolates the rock from the red sandstone above. We made the slaves dig in two places in the lowest part of two chambers the most likely to contain fossils. The floor is for the most part destitute of stalagmite, but abounds in many places with loose fragments; occasionally, indeed, with large rocks fallen from above. In the first chamber, which is sunk considerably beneath the adjacent rooms, the labourers dug five feet deep, at first through a clay soil, which became moister below, intermixed with numerous fragments of stalactite; they did not reach the bottom rock here. The next digging occurred at the extreme end of the first left branch of the cave, and after excavating three feet deep, they came to solid rock. We now ascended ladders, and crawled and scrambled through several chambers, most of which presented such a monotonous aspect, that we grew fatigued, and proposed to our guide to return. The original or natural entrance, consists of a mere fissure in the rock, of a size only sufficient for the passage of a fox; a circumstance which diminishes the chance of finding fossil bones. It was to Mr. Wyers following a ground-hog (*Arctomys Monax*) to a hole in this hill, that the discovery of the cave was owing, in February 1806.

The disturbed and confused appearance of the interior of the cave, as well as of the huge masses of mountain rock which are

found on the surface, can only be accounted for, by supposing powerful subterranean disturbances. On our return we visited MADISON's cave, about two hundred yards nearer the hotel. Unlike the other, this cave has no artificial door at its entrance, to prevent the ingress of strangers; the "*old cave*" as it is now called, being considered as beneath notice, since the discovery of the new one. The entrance of both is more than one hundred feet above the level of the river; the ascent to either is very precipitous. The entrance to Madison's cave is spacious, the surface of the floor is less rugged, and is also, for the most part, destitute of stalagmite; salt petre has been obtained from the earth taken from the floor of this cave. From the appearance of things we thought that the occurrence of fossil bones in this locality not improbable, and we set our labourers to digging in two of the lowest positions of the two first chambers. In the deepest room, the floor consists of clay—then at three feet depth, of red earth, or decomposed red sandstone, one foot in thickness, which lies on the original floor of the cave, resembling a compact red sandstone. Whilst the digging was going on, we followed our guide along a narrow high gallery, by a continuous descent of some hundred feet, until further progress was interrupted by a body of crystal water, which is said to be of immeasurable depth, and beyond which no one has yet explored; some terrible tale of silent suction existing in this water, has become prevalent in this neighbourhood, and effectually paralyzes the efforts of the exploring *Homo troglodytes*.

Our researches continued actively for five hours, when we returned to the hotel, fatigued, covered with mud, and disappointed in our expectations of obtaining fossil relics. We dined at 2 P. M. and immediately continued our journey, and after a ride of fourteen miles arrived at Harrisonburg, via Port Republic, over a road indescribably bad. The weather has been so cool since our arrival in these mountainous regions, especially subsequent to the thunder storm, which we encountered north of Charlottesville, that fires are kindled at all the hotels at which we halt, and cloaks are an agreeable appendage during the day. Contrary to theory, the season is less advanced on the south-west limestone region of these mountains, or what is known as the great valley of Virginia, than it is on the more northern exposure; the leaves on many of the trees have been destroyed by the frost.

of the 12th inst. At Harrisonburg, formerly called Rocktown, there resides a French family, emigrants from Strasburg, on the Rhine, who settled here three years ago, with the intention of cultivating the grape vine. Their vineyard has been totally destroyed the present season, by the recent severe frost, just at the moment they expected to reap the fruits of their labours. The sudden vicissitudes of temperature to which this elevated situation, as we are informed, is constantly liable, will at all times render it unfriendly to the cultivation of the vine.

We left this village at half past 7 A. M., and after a ride of ten miles, arrived at the "Big spring," which should rather be called a river, so large is the body of water which rises suddenly from the foot of a limestone hill, and continues in a stream of some yards in breadth, and half a foot deep, with force sufficient to turn two large mills immediately below: this stream of water is exceedingly cool, and does not contain any fish; it is artesian, or ever flowing, and is always very pure, excepting, as a Dutch girl informed me, "just before it was going to rain," when, she said, it became turbid. It has only ceased to flow once, in the memory of the oldest settlers, when it remained dry three days, to the great terror of the farmers who hold mill seats immediately on it.

This stream is situate on the main valley route, Rockingham county, about five miles west of the Massonetto mountain, which ridge is parallel to the Blue mountains, and nearly fifty miles long. Continuing our route, three miles from the "Big spring," on a line with the mountain, we halted to dine at an inn, kept by *Mr. T. K. Fuller*, an emigrant from the State of New York, who says he has resided in Virginia nine years, and detests the slavery system, seeing that the Dunkards who reside in this vicinity, and who abjure slavery, possess farms in every respect superior to those of their neighbours. *Mr. F.* possesses a taste for natural curiosities, and has his bar room filled with what, in your geological lectures, you styled "n. k's." *Mr. Fuller* appeared concerned, to think that people will have it that he knows something of the science of mineralogy, of chemistry, &c. &c. but he frequently repeated, "it is all a mistake; *it is all natural.*"

We left this station, after having made an arrangement with *Mr. F.* for exchange of N. K's, on our return to Philadelphia—he possessed some fine specimens of Ammonites, and a Trilobite,

from the Massonetto ridge, in the vicinity, which, under the names of "*fossil toad, and fossil snake,*" he hugged to his bosom with parental fondness; no reasonable sum would induce him to part with them; he at length consented to exchange them for "sea-shells, corals, &c. or any queer thing that comes from the great ocean." Having passed through New-Market, and crossed the north branch of the Shenandoah, at 7 P. M. halted for the night at Pitman's. We have travelled the whole day over roads cut or worn through limestone, uncovered by soil, and in the worst condition; the limestone is quite black, of the variety called Hydraulic, from the water cement which is made of it. This formation continues nearly the whole length of the Massonetto ridge, and has evidently been subjected to violent disturbing powers from below, and subsequently, water worn on its surface: the strata are occasionally a foot or two thick, and dip towards the mountain, SE. to the NE., at an angle of 45° ; at other times the strata emerge vertically—again they appear in large irregular masses, sometimes almost comminuted, and frequently resembling slate so strikingly, as to be mistaken for it until more closely inspected, hammer in hand. In one place they form a narrow pass, over which the public road lies, and which is known here by the name of "the narrows:" it is about twenty feet wide, and displays a perpendicular precipice on each side, nearly eighty feet high, with a small river on either side, unconnected at this place. This "*narrow passage*" is four miles south of Woodstock, ten miles north of Mount Jackson. On the great valley road, there is another remarkable display of this curious hydraulic limestone rock; this is a denuded hill, through part of which the public road passes; on the very summit of which there is yet a small sprinkle of red diluvium—but all the slope is naked, and the faces of the projecting strata are water-worn and smooth. The roots of pine trees, which once occupied this slope, are still seen wedged in the crevices of the rock; this denudation was occasioned, as the neighbours assured us, "by the bursting of a cloud," whose awful consequences they witnessed, to their great loss and terror.

I could refer their account to no natural phenomenon, unless it be to the bursting of a water spout. The disturbed strata of this limestone, are here well contrasted with it in its natural state. Arrived at Winchester, at 7 P. M.

Thursday 26. After breakfast set out for *Harper's Ferry*, distant thirty miles; passed through, and dined at *Charleston*; much rain had lately fallen in this vicinity, and the roads, bad at best, are almost impassable; two miles per hour we found to be rapid travelling, in their present state. The black lime rock continued almost to *Harper's Ferry*. The view at this gap suddenly burst open before us in all its glory, as we gained the summit of a hill about a mile distant, and richly repaid us for all our fatigue and toil. The rocks which overhang the river, are composed of green slate, somewhat talcose, which disintegrates rather fast in exposed situations, and masses are continually falling. This slate rests on a fine-grained, solid granite, very appropriate for the great rail road, which is to pass here.

Friday 27. We left this enchanting scenery about 10 A. M. lodged the same evening at *Leesburg*, and arrived at *Washington* at 1 P. M. on Saturday 28th, one of the hottest days experienced the present season. The last four miles previous to entering *Georgetown*, the road leads along the *Potomac canal*, through gneiss and granite rocks: higher up the river, it is said that anthracite has been discovered.

NEW METAL, PROVISIONALLY CALLED VANADIUM.

Extract of a Letter from M. Berzelius to M. Dulong, read before the Academy of Natural Sciences at Paris, Feb. 7, 1831.

"M. Sefström, director of the school of mines at *Fahlun*, whilst engaged in examining a variety of iron remarkable for its extreme softness, observed the presence of a substance, the properties of which differed from those of all other known bodies; but its quantity was so small as would have rendered it tedious and expensive to collect sufficient for an examination of its properties. This iron was from the mine of *Taberg* in *Smoland*; the ore merely contained traces of the substance. Finding that the pig iron contained far more of this principle than the wrought iron, M. Sefström thought that the scoria formed during the conversion of the pig iron into wrought metal, might be a more abundant source—a conjecture confirmed by experience; so that sufficient having been procured, he went to Mr. Berzelius during the Christmas holidays, to complete its examination. For the present the substance is called *Vanadium*, after a Scandinavian divinity.

“ Vanadium combines with oxygen to form an oxide and an acid. The acid is red, pulverulent, fusible, and on solidifying, becomes crystalline. It is slightly soluble in water, reddens litmus, and forms yellow neutral salts, and orange bisalts. Its combinations with acids or bases, have the peculiar property of suddenly losing their colour—they resume it only on becoming solid again, and being then re-dissolved, preserve their colour. This phenomenon appears to have some analogy with the two states of phosphoric acid and of phosphates.

“ Hydrogen at a white heat, reduces vanadic acid, leaving a coherent mass, having a feeble metallic lustre, and being a good conductor of electricity, but it is not certain that the reduction is complete. Vanadium, thus obtained, does not combine with sulphur when heated to redness, in its vapour. The oxide of Vanadium is brown, or nearly black, and dissolves readily in acids. The salts are of a deep brown colour; but, by the addition of a little nitric acid, effervesce, and become of a fine blue colour.

“ Vanadic acid, combined with another acid, is reduced by sulphuretted hydrogen, and even by nitrous acid, to that blue matter which appears to be a compound of Vanadic acid with the oxide of Vanadium, analogous to those compounds formed by Tungsten, Molybdenum, Iridium, and Osmium. The oxide and acid of this metal together produce other combinations, green, yellow, and red, all soluble in water.

“ When the oxide of Vanadium is produced in the humid way, it is soluble both in water and alkalies. The presence of a salt renders it insoluble, and upon this effect may be founded a process for its preparation.

“ The Vanadates, when dissolved in water, are decomposed by sulphuretted hydrogen, and converted into sulfa salts, of a fire red colour.

“ The chloride of Vanadium is a very volatile, colourless liquid, producing thick red fumes in the air. The fluoride is sometimes colourless, sometimes red, but always fixed. Before the blow-pipe Vanadium colours fluxes of a fine green colour, in that respect resembling chrome.”*

* On the 28th of February, M. Humboldt stated that the same metal had been discovered in Mexico, by M. Del Rio, in a brown lead ore from Zimapan; who had named it Erythronium, but was induced to suppose it not a simple substance, but an impure chrome: upon a re-analysis of the ore of Zimapan, it is found the metals are identical.

Our attention having been attracted to the preceding letter, we naturally sought to be informed from our venerable and esteemed friend, Professor del Rio, why the merit of a discovery made by him, and announced in 1804, in his translation of Karsten, should be transferred to another chemist, for detecting the same metal in iron, in 1830. We subjoin his answer, not less remarkable for his analytical skill in chemistry, than for his good sense and modesty.

We should under any circumstances expect objections to be made to the term *Vanadium*, derived from an ancient Scandinavian Deity. We dislike the introduction of such puerilities into science. Far better would be the term *Zimapanium*, since it was first found in the brown lead ore of Zimapan. But upon this occasion, that the complete measure of justice may be done to an eminent and deserving philosopher, we venture to express a hope that in place of the provisional name *Vanadium*, the more compendious one of *Riom* or *Rionium*, may be substituted.

It is very clear that Del Rio was first induced by Humboldt, to doubt of his own discovery, and, subsequently, when M. Descottis—who was familiar with Vauquelin's discovery of the metallic nature of chrome, and whose pupil indeed we believe he was,—threw his weight into the scale of Humboldt, M. Del Rio diffidently forbore to press his own better opinions, against those of the Europeans, whom he supposed possessed of superior opportunities of judging than himself, and likely to unite against him.

EDITOR.

TRANSLATION OF A LETTER FROM PROFESSOR DEL RIO.

Philadelphia, July 13, 1831.

SIR,—I have always been of opinion that it is of greater importance to science, that the world should concern itself more with the discoveries that are made, than with those who make them; and I experienced a lively satisfaction in learning through Professor Jameson's Journal, that Mr. Wohler had found Vanadium in the brown lead ore of Zimapan. *I entertained the opinion, twenty-nine years ago*, that it contained a new metal, which, at the time, I called *Pancrome*, on account of its producing the three fundamental colours, blue, yellow, and red. Subsequently I named it, *Erihrome*, having observed a very curious phenomenon connected with it. The colourless salts, e. g. the Vanadiate of

ammonia in slender acicular crystals, takes the finest crimson red, as soon as a small drop of concentrated nitric acid is placed on it. The same thing takes place with those of potash, soda and lime. Those of barytes, as far as I remember, not having with me my notes, became by the same method, at first, yellow, and afterwards red. I found also, as may be seen in my translation of the mineralogical tables of Karsten, published at Mexico in 1804, that the acid was fusible into an opaque and brown mass, with very fine stars on the surface, which had a semi-metallic lustre. I perceived that the acid was not red itself, except when distilled to dryness, with nitric acid, or when the acicular crystals of Vanadate of ammonia, were put under the muffle. I found also, that the acid did not precipitate the nitric solutions of silver, of mercury and of lead, of a red, but of a yellow colour.

I communicated my experiments to Baron Humboldt, when he arrived in Mexico, and he stated to me, that my metal had the strongest resemblance to chrome, especially on account of the fine emerald green it takes when under the blow-pipe: which occasioned me to observe both in my translation of Karsten, in the year 1804, and in the nineteenth number of the Annals of Natural Sciences, which were then published at Madrid, under the direction of the celebrated Cavanilles, that I supposed it to be a sub-chromate of lead. M. Descotils, a year afterwards, expressed the same opinion. I confess, however, I could not suppress my astonishment, that no one took any notice of what I believed to be a blue oxide, nor of the beautiful phenomenon of the colouring of the salts red, by nitric acid, or by heat. I am content, however, with having always sustained that the brown ore of lead was not a phosphate, believing it identical with the brown lead of Schemnitz in Hungary, and of Huelgoet in Brittany.

You will please, Sir, to give these observations a place in your Journal, if you deem them worthy of insertion there. Its establishment is a source of great satisfaction to all those who know how well you deserve the reputation you have acquired.

I remain, Sir,

Your affectionate Friend.

A. DEL RIO.

TO MR. FEATHERSTONHAUGH.

EXPERIMENT WITH FLOWERS.

If the lobelia fulgens, which is of a pure blood-red, is viewed by the light of an alcohol lamp, with a little salt added to the wick, it becomes absolute black, which is not the case when observed by solar, or chemical light. The scarlet geranium too, naturally reflects a compound of red and yellow, but when seen by the spirit lamp, with salt, appears yellow. Purple colours under like circumstances appear blue. If a candle is put on one side of the lobelia, and a spirit lamp on the other, one half appears black, and the other, red. The explanation of this beautiful experiment is suggested by the study of the nature of reflecting bodies, and of light. Coloured bodies are so formed, as to reflect rays and combinations of rays, peculiar to them in their natural state. Hence, red flowers reflect the red ray which they obtain from light. But the light of a spirit lamp gives out—as may be proved by a prism—no red ray, and hence the lobelia, when observed by this light, has no red ray to reflect, and appears black. The geranium receives no red ray, and appears yellow. The purple receives no red ray, and appears blue. Those unacquainted with the properties of bodies and of light, are generally contented to believe that the natural colour of an object belongs to it inherently, as much as its form does. But this is not so. Whatever the reflecting structure of bodies may ultimately depend upon, they must be in connection with light before they can reflect; and as it is remarked, in a work that will perhaps bear reading oftener than any other that modern times have produced, “Preliminary Discourse on the study of Natural Philosophy, by John Frederick William Herschell,” &c. &c. “when the differently coloured prismatic rays are thrown, in a dark room, in succession, upon any object, whatever be the colour we are in the habit of calling its own, it will appear of the particular hue of the light which falls upon it. A yellow paper, for instance, will appear scarlet when illuminated by red rays, yellow when by yellow, green by green, and blue by blue rays; its own (so called) proper colour *not in the least degree mixing with that it so exhibits.*”

Perhaps at some future day, light may be so managed, as to admit of bodies reflecting particular colours, without adding the expense of dying or painting to them.

EDITOR.

ANTHRACITE COAL APPLIED TO GENERATE STEAM POWER.

THE Editor had the satisfaction, a short time ago, to direct the public attention, to the simple means adopted by Mr. John Price Wetherill, of this city, to remedy the defect inherent in this Coal, viz: the want of hydrogen. The Editor is informed by that gentleman, that a great many persons were induced, in consequence, to visit his White Lead Works, and to adopt his improvement. The non-bituminous coals of this state, which are now universally called anthracite, vary somewhat in their qualities. Some are more easily ignited than others, have a portion of sulphur in them, and leave a greater residuum; but they may be generally designated as hydrates of carbon, the purest containing upwards of ninety parts of carbon, water, and a siliceous earthy residuum, which we understand from some of the master masons here, *sets mortar better* than any siliceous matter they have hitherto used. The small quantity of hydrogen given out by this coal, is insufficient, or has been hitherto thought so, to produce the proper degree of flame wanted to generate steam. Hence, its application to generate steam power, has been almost despaired of, and hence, also, the insignificance of its value for this purpose, when compared with bituminous coal. There have been attempts in many quarters to remedy this great defect, and which have been attended with more or less success. We have materials on hand for showing with how much energy, persons at a great distance from each other, have been exerting their ingenuity in this direction. The details of a conflict of this kind, between art and nature, would not be uninteresting; indeed, what concerns us more nearly than the history of the gradual ascendancy of mind over matter, and the steady progress of man's dominion over nature. Upon the present occasion, we shall confine ourselves, with one exception, to a brief relation of the manner in which, from the simplest beginnings, Mr. Wetherill's discovery grew into importance.

In January, 1825, Messrs. Jonah and George Thompson, of this city, completed, for their Phœnix Nail Works, on French Creek, a steam engine for anthracite coal. We understand this was the first successful application of this fuel to the generation of steam. This was accomplished by a sub-division of the fur-

naces, and other mechanical arrangements. The necessity of increasing the flame, induced them to try many experiments. The introduction of steam was resorted to, and succeeded to a great extent. These experiments were made in July, 1829.

The history of Mr. Wetherill's improvement is remarkable for its simplicity. In the early part of 1829, to obviate the inconvenience arising from the dust when the cinders were riddled, water was thrown on them, and the cinders being very hot, the water was decomposed, and the effete residuum of the coal gave out more flame than the anthracite when first ignited. Mr. Wetherill, who is a good practical Chemist, and who, like every body else, had often witnessed the effect resulting from water thrown upon fire, without attending much to it, saw now what a useful application could be made of it. Accordingly, when the flame is low in his bed of coal, he, by means of a small pipe connected with his boiler, which is led under the grate of his furnace, passes a stream of steam into the hot coals, which is decomposed, and the hydrogen, when it reaches the top, becomes a powerful flame, that can be regulated by the quantity of steam admitted. When the cock of the pipe is stopped, the flame dies away, when it is turned, it revives.

Considering it probable, that this method of producing the inflammable principle, will effectually cure the inherent deficiency of non-bituminous coals for the generation of steam power, we regard it as leading to ulterior consequences of primary importance to the coal interest, and the useful arts. We especially look to steam navigation, as likely to derive immediate profit from it. There is no known fuel of which vessels can carry so great a burden, as of anthracite coal. One of the great objections to marine steam navigation will be thus overcome. We encourage the hope, therefore, that marine steam navigation, which, from various causes is slow in establishing itself, will, ere long, be universally successful, and that the steady velocities of rail-road communication, may be transferred, in a great extent, to navigation. Ere this takes place, we think it probable, a revolution will be effected in the forms of vessels, and that the perpendicular sides of ships, necessary to give room to the machinery of masts and sails, will be abandoned for improved constructions, consistent with perfect safety, and peculiarly fitted for steam navigation. Vessels as they are now constructed, present perpendicular sides

to the assaults of the waves, or a definite resistance, to an indefinite power of attack. We had an opportunity three years ago, of inspecting the break-water, at Plymouth, in England. Its massive perpendicular walls, promised to defy the violence of storms, but they soon gave way: nor was it until outward slopes, or inclined planes were constructed, that the power of the waves was defied. We can conceive of vessels of vast burden, fitted for oceanic navigation, with abundance of room for freight and fuel, where the decks shall be covered in with a perfect watershed, like the roof of a house, and the machinery be placed below. Such vessels might be made perfectly tight against stormy weather, and admit of every comfort in fine weather.

We have ventured upon these reflections, merely to draw the public attention still more to the great value of the non-bituminous coals of the State of Pennsylvania.

EDITOR.

DESCRIPTION OF THE JAWS, TEETH, AND CLAVICLE OF
THE *MEGALONYX LAQUEATUS*.

By Richard Harlan, M. D.

WE are indebted to our friend Dr. Harlan, for the following valuable paper. Knowing the deep interest which is taken in the fossil osteological remains of this continent, and especially by the naturalists of Europe, we have deferred other matters for the present, and have caused drawings and engravings to be made of the bones described in this paper. They are entirely new, these being the first jaws, and teeth, and clavicle of this extinct animal, hitherto found. In order to give our readers, at home and abroad, the most perfect satisfaction in our power, respecting these interesting remains, we have, with the permission of our valuable correspondent, Dr. Harlan, added to our plate, the isolated tooth of the *M. Laqueatus*, first described by him in his paper, read March 8th, 1831, before the Academy of Natural Science of Philadelphia.

EDITOR.

“Desirous of examining the fossil bones, now in New York, in the possession of Mr. Graves, I proceeded there with my friend, Mr. Norris. Amongst others, I found a bone, which I had not seen before, and which is the first that has been described of this animal. I presume it to have been the clavicle of a *Megalonyx*

laqueatus, lately described by me, as portions of this part of the skeleton of this species, were found at the same time and place. The individual, of which the remains now described, were a part, was older and larger than the one discovered at White Cave, Ken.

“This clavicle* belonged to the left side, is long, flattened, and slender, curved somewhat like the human clavicle. The sternal extremity is thickened and hemispherical, where it forms the articulating surface: the scapular extremity is compressed, and furnished on the inner, or inferior surface, with strong tubercles for the attachment of ligaments. The anterior, or superior aspect of the sternal extremity, is marked by an arterial groove. The length of the clavicle is seventeen inches, the greatest circumference, four inches; the breadth one inch and eight-tenths; the greatest thickness, one inch.

“The fragment† I am now about to describe, is a portion of the dexter lower jaw of the *Megalonyx*, containing four molar teeth; three of the crowns of these teeth are perfect, that of the anterior one is imperfect. These teeth differ considerably from each other in shape, and increase in size from the front, the fourth and posterior tooth being double the size of the first, and more compressed laterally: it is also vertically concave on its external aspect, and vertically convex on its internal aspect; the interior, or mesial surface is strongly fluted, and it has a deep longitudinal furrow on the dermal aspect, in which respect it differs from the tooth of the *M. Laqueatus*, previously described by me,‡ of which the dermal aspect is uniform, but to which, in all other respects, it has a close resemblance. I suppose it therefore, probable, that this last may have belonged to the upper jaw. The three anterior molars, differ in shape, and markings: they are vertically grooved, or fluted, on their interior and posterior aspects, a transverse section presenting an irregular cube. The length of the crown of the posterior molar is two inches; the breadth about five-tenths of an inch: the length of the tooth is three inches and six-tenths. The diameter of the penultimate molar is eight-tenths by seven-tenths of an inch. The length of this fragment of the jaw bone is eight inches and four-tenths; the height three inches and six-tenths: the length of the space oc-

* Figure 7, plate 3. † Plate 3, fig. 1, is a flat view of the Jaw, looking down. Fig. 2, the interior aspect. Fig. 3, the exterior aspect.

‡ No. 4, is the fluted surface; No. 6, the external, or dermal surface; and No. 6, the crown of that tooth.

cupied by the alveolar sockets, five inches and eight-tenths. The crown of the tooth presents no protuberances, but resembles that of the sloth; the roots are hollow.

"There is also in Mr. Graves' collection, a tibia, nearly perfect, from the right leg: the segment of a flattened sphere, on which the external condyle of the femur moves, is rather more depressed, than in the specimen from White Cave. Other marks and peculiarities are observable on this bone, not found on that of the *Megalonyx* of White Cave, but they are probably due to a difference in the age of the individuals.*

"Of the remains of Mastodons in this collection, I shall only notice the recomposed cranium of an animal, not yet adult, but which appears nearly perfect. The tusks are of an enormous size, and there exists a very deep cavity immediately anterior and below the aperture for the anterior nares, for the lodgment or origin of the large muscles which moved the trunk. This cranium does not appear to differ specifically from that of a specimen in Peale's museum, New York, and which gave occasion to the too hasty proposal of a new genus, under the designation 'Tetracaulodon,' or 'four tusked;' a name which would be more appropriately applied to the wild boar, the *Hippopotamus*, and many other quadrupeds which are furnished with four tusks.

R. HARLAN."

THE UNITED STATES ARE EXEMPT FROM DESERTS, AND
ALL THE EVILS CONSEQUENT THEREON.

THE physical conformation of North America, precludes all possibility of deserts, or extended wastes. Those arid regions result from a want of moisture, and attach to those extended plains in the neighbourhood of the tropics, too vast and disproportioned for the quantity of rain that nature has assigned to them. They drink, and are still dry. The clouds of heaven float over them in vain. Like Pharaoh's kine, they devour all, but change not their miserable condition.

* From these very lucid details, it is evident that if persons in possession of isolated osteological remains of this character, would submit them to the inspection of an experienced comparative anatomist, we should soon be in a situation to reconstruct this, and many other extinct animals of this continent. We invite gentlemen to correspond with us on this interesting subject; a rude drawing will be sufficient to enable us, if required, to apprise them of the intrinsic value of the objects represented.—[Editor.]

What are those physical phenomena that have insured us against all the ills of deserts? Geography tells us, that whenever a continent or country is expanded, more than a few hundred miles, in the equatorial regions, with a surface comparatively low and flat, it will become a desert. This is the result of the natural inability to be supplied with moisture. Most of Africa; the middle and southern regions of Asia; and even Hindostan, where mountains do not prevail, have become sterile and desert. The face of nature in those countries, is deformed; and vast chasms are created in those regions, where the vegetable and animal kingdoms are unable to flourish.

New Holland owes its moisture to its insular situation: the peninsular form preserves fertility in Spain, Italy, Greece, and Asia-minor: back-bone mountains save Hindostan from entire barrenness; and the vicinage of some sea, or mountain elevation renders those parts of Africa, Asia, and Europe, which the great deserts do not reach, the fit abodes of man. In Central Africa, and Asia, and the coasts of the Red sea and Indian ocean, no mountains exist, to collect from the atmosphere stores of moisture, and spread them over those thirsty plains, to fertilize and clothe them with verdure. No commanding Cordilleras overlooking their plains, catch upon their long slopes the vapours of heaven, and preserve, upon their cloud-capped summits, reservoirs of eternal snow, with which to irrigate the plains that meet their base. It requires, then, a mountain range; the vicinage of some sea, or ocean, or a high, temperate latitude, to insure freshness to extended plains, and impart to them a fertility, proper for the comforts and wants of man.

Let us examine our own continent, and learn the causes that have guaranteed to us, this exemption from deserts. Within the tropics and their neighbourhood, N. America is narrowed into a strip: it has all the advantages of an insular position, and drinks the moisture of two oceans. This is not all: the Cordilleras traverse the whole space, rising upon the Mexican table, to an elevation of 11,000 feet, and commanding the neighbouring seas. All winds, but more especially the heavily laden trades, pour forth their vapours upon this happy region, and clothe its long slopes and rich plains, with all the luxuriance of vegetation. These friendly mountains, after upheaving the tropical parts of our continent to the regions of eternal verdure, bear aloft their

wide spread arms, (the Chippewayan and Alleghany ranges) as far as it is necessary to counteract the heats of a southern sun, and impart fertility to the great valley of the Mississippi, which seems especially consigned to their fostering care. But when elevations become no longer essential to the certainty of moisture and vegetation, they sink into the great plains of Canada, and disappear. How wise is this arrangement! For if these mountains had carried their characteristic elevation far north, they would have chilled with their eternal snows, all the northern portion of our country, and rendered it barren, not from drought and deserts, but what is equally to be deprecated, the blights of intolerable cold. These friendly ranges of mountains, are thus the everlasting guarantees of our country's fertility. The Alleghany range derives its moisture from the Atlantic, and waters not only all the States that intervene between it and that ocean, but the States and districts that rest upon its western base, and contributes its full part to the great plains of Mississippi and Missouri. The Rocky, or Chippewayan range, draws heavily from the Pacific ocean, and abundantly waters not only that slope, but the extended plains which meet its eastern base. The narrow slopes of the two ranges of mountains which border the two oceans, are easily and very naturally irrigated from those oceans; and their slopes pointing inwards from the oceans, and the plains immediately in contact with them, draw moisture from the numerous founts and reservoirs of the mountains themselves. The great valley of the Mississippi, however, is too extensive, and too important to the rising population of this country, to be left to any uncertain supply of moisture. The sources of the mountains with which it is enfiladed, might prove to be inadequate, and certainly would, if all depended on them. Other guarantees are found; and powerful aids provided in the case. That great valley opens itself without barrier, on the southern end, to the trade winds, which become deflected by the Mexican coast, enter it, fraught with all the moisture of the gulf, and deposit on this region, a supply, literally inexhaustible, because those winds themselves are perpetual. Lest the mountain supply and trades both, might not reach the northern end of this great plain, nature has thrown there the largest reservoirs, or accumulations of fresh water in the world. The great and numerous lakes of Canada, over which the winds pass, and from which clouds charge them-

selves with vapour, insure a never failing supply of water to all that portion of the plain which lies contiguous. Thus every thing is provided, and nothing left to chance. Elevation, mountains, contiguous oceans, and internal reservoirs, all co-operate to insure to the territory of the United States a constant supply of moisture. The native fertility of the soil is therefore great, and yields to the wants of man with certainty and abundance. This supply of moisture is well tempered, and rarely pours forth in excess. In some countries, particularly in the north of Europe, in England and Ireland, the crops oftener fail from excess of moisture, than a deficiency. The grain blights in the field, or moulds and rots in the granary, and acquires a musty smell and flavour, which takes away its merchantable character, and disqualifies it for the fine breads. Our seasons, fortunately, are just moist enough to give perfection to vegetable growth, without injuring it by excess: just regular enough to exempt us from all the labour of artificial irrigation, and leave the air dry and elastic enough to enable us to preserve all our vegetable productions. Happy country! where the elements hold so steady a balance; where rains prevail to mature, not to injure vegetation; where the sun shines to ripen, and not to parch up verdure; and where a clear, elastic air gives spring to the animal frame, and vigour to all nature.

Where deserts exist, they not only preclude vegetation, and consequently population in the districts where they prevail, but exert a baneful influence upon all the neighbouring regions that are inhabitable. They absorb the moisture from them, and render vegetation very uncertain. The heats that steam from the deserts, enfeeble and stint all that has life and growth in the adjoining districts. Siroc winds prevail, collect the deleterious matter, heated and active, from their parched surface, sweep the neighbouring countries, carry languor, disease and blight in their train, and convert all that is green into a brown desert. Hordes of locusts seem by nature, associated with the deserts; rise in clouds, warp upon their winds, and like a deadly blast, couch upon the adjacent countries, and destroy all that is verdant. It results, therefore, that deserts not only mar the habitable globe to the extent that they prevail, but inflict upon the adjoining countries, all the evils of famine, uncertainty, and disease; thus limiting the numbers, the comforts, and the power of man.

We will now briefly note the effect of deserts upon the human figure, upon population, industry, the arts, morals, and liberty. The human form in connection with deserts, is without its wonted symmetry—thin, dry, and emaciated; and the complexion dark swarthy. Man seems formed there to drift with the sands, to move his light and elastic frame with all the quickness that uncertainty might require, but possesses not the muscular power necessary to effective labour. The Africans, Arabians, Tartars, Bedouins, and others, are swarthy, dark, and devoid of all the symmetry of which the race is susceptible, and strikingly illustrate our position.

In such countries population is sparse, and the few who draw a scanty support from the stinted and uncertain vegetation, are unfixed in their habits, and wanderers. They realize nothing, improve not their condition, are actuated by the sudden impulses of want, or the emergency occasioned by the irregularities of the elements around them.

When the seasons and climate of the country in which man lives are uncertain; when no human effort can control them, and no art or foresight render labour available, he partakes of all the irregularity of the seasons; becomes as wild as nature herself; puts himself afloat with the elements, and is in his turn a devastator.

If industry exists not, and human labour be unavailable, none of those improvements which change the condition of our race, and give to us character and comfort, have any existence. Without surplus production, there can be no commercial exchanges; a limit is thus placed to social improvement, and a barrier erected against civilization. Man, under such a state of things, cannot multiply his race, because his supply of food is limited; nor create wealth, because his labour is unproductive and without stimulus; nor make valuable improvements in the arts, comforts, and intercourse of society, because he has neither the means nor the necessary numbers; nor can he polish and refine himself, because his state of society is essentially wild and violent.

Morality, is there, nothing beyond those simple virtues which are connected with self-preservation; that rude hospitality, the necessity of which, dire suffering has felt; and that reckless bravery which has been prompted by despair. High and honourable

feelings, sterling integrity, truth, and that habitual propriety that discharges all the duties of man to his fellows; are unpractised, and comport not with such an uncertain state. The religion of the inhabitants of the desert, is wild and superstitious, because it has no moral guarantee. The imagination creates the punitive power that makes brown the desert, that waves with the sands, and spreads around famine and devastation. It is invoked to destroy, and worshipped from fear. The ways of God to man are not justified, as in that fabric of good order, intelligence, and virtue, which is reared under more favourable circumstances.

Liberty, in such countries, is the freedom of the desert, as unfixed as its votaries, and as wild as nature herself. Man's safety there, is not the guarantee of the laws, but the strength of his own arm, or the ease with which he can escape. He governs himself by circumstances, not by any principles of justice, or legislative enactments. Government has reared no permanent altar in such countries; it moves in wild democracy with the wanderings of man; and accommodates itself to all his irregularities. We see, therefore, that our race, in such countries as are connected with the deserts, is scant and of uncouth form; their virtues wild and rudely primitive, their labour unavailable, wealth and improvements have no place, the arts and elegances of life have no existence, commerce no basis, liberty and religion no temples but the desert, and no guarantees but a wild and irregular nature.

In the United States it is widely different. We are exempted from deserts and all their concomitant evils. An almost uninterrupted fertility spreads through our extensive land, with scarcely a mountain crag to break its continuity. Equally secure from an injurious excess of moisture, we lean with confidence upon our seasons; we understand our climate, we appreciate the productiveness of our soil, and feel that we have all the guarantees which nature can give against want and famine; all the certainty of property in the avails of our labour, every stimulus to exertion and industry, and the most perfect assurance to us and our posterity, of moral and physical enjoyment. Where nature herself is regular, the population full of intelligence, the arts well established, and plenty throughout the land, good order and good taste will prevail. Liberty, with just government, is the natural consequence of such a condition of things. Already has it taken

deep root. Every right is regarded, and every interest protected. The broad shield of the law covers all. Famine, and unavoidable disasters, drive man to despair; he looks to the present moment only, because the future is wrapped in doubt; he runs all chances, and neglects all system, and the providence necessary for accumulation and comfort. Under the mighty guarantees that we have named, we may expect great perfection in our race, a maximum population, a productive industry, a moral condition, a high degree of intellectual developement, the greatest advancement in the arts, commercial prosperity, all the refinements of society, and a government of laws which will reach and guard all.

All these blessings are in store for this nation, if the people are true to themselves. Nothing can impede the happiness and glory of this people, if they can only be led by a wise and general system of education, to reject the insidious pretensions of artful and selfish men, and to lean voluntarily upon the wise and just for the administration of their affairs, and the preservation of their institutions.

W.

EATON'S GEOLOGY.

Communication from the writer of the article "Geology," in the North American Review, for April, 1831.

THE writer of the article "Geology," in the number of the North American Review, is not surprised to learn that Professor Amos Eaton, and his friends, have winced under the merited castigation he received. That they should have put his defence upon his "having contributed to awaken the spirit of inquiry on geological subjects in this country," was to be expected, and is admitted to be true to a certain extent. Mr. Eaton has done for geology, pretty much what the bellman does for a lost child; he has set people looking for it. In a passage in the preface to his geological text-book,—the work reviewed in the article above alluded to—he gives us at once a clue to his own capacity in this line, and for the moving causes which have brought one of his defenders forward, in a somewhat unexpected manner. This is the passage: "Geology is a progressive science; and he, who has any respect for his future reputation, should be exceedingly

cautious about committing himself on matters of fact or speculation. I confess, that I have, *most egregiously*, violated this rule; but there are peculiar circumstances in my case, arising from my being 'a hireling drudge' to the most *munificent patron* of this science, which will palliate, at least, if not justify." This passage in the original is italicised, and pointed, exactly as it is here printed. It would be a difficult matter to produce from the annals of literature, a more extravagant instance of self degradation, than this passage unblushingly exhibits.

Mr. Eaton has discreetly remained silent under this infliction, which, as it is stated in the article, fell upon him from a reluctant hand, "actuated solely by regard for the interests of science, and not taking pleasure in wantonly exposing Mr. Eaton, or any other individual." But Mr. Eaton's friends have not been equally discreet: his "munificent patron"**—who is only once referred to in the article, and then under the designation of "a generous individual"—is brought forward in an offensive attitude; and in a note referred to by a postscript of the Editor, appended to the July number of "The American Journal of Science and Arts," is made to take up a position which neither covers his allies, nor protects himself. General Van Renselaer's note, to be sure, is flanked, right and left, by the postscriptum of Professor Silliman; but the Professor's demonstrations, although flattering to an inexperienced eye, seldom in the field, look plaguily like going over to the enemy. The Professor is an amiable and a peaceful man, one who has a proper horror of the "charge"—a movement so pregnant with excitement to men with a belligerent turn—and who knows that a scientific bayonet would not come doubly blest, the pleasure, in such cases, being altogether monopolized by the giver. When the Professor, however, says, that the appearance of General Van Renselaer's note, is "less an act of courtesy than of justice," he means, no doubt, to inspire General Van R. with the belief, that he entirely concurs with that gentleman in his opinions, as they are found in the following passage of his note.

"It is to be regretted that the author of the review, whose professed object was to advance the science, did not examine professor Eaton's views with a little better spirit, and *point out*

* General Van Renselaer.

and correct the supposed errors. Let any serious mistakes be pointed out, and fairly proved," &c. &c.

As the critic in the N. A. R. finds himself thus publicly reprobred and challenged, before the bar of the public, by individuals who, in the language of legal practice, have chosen to change the venue, from the North American Review of Boston, to the American Journal of New Haven: he, to secure to his cause, the utmost attainable fair dealing in the case, chooses the Monthly Journal of Geology, of Philadelphia, as quite appropriate to the conduct of a controversy originating in geological matters.

Before the writer shows how completely he stands justified with the public, in relation to the manner in which he reviewed Mr. Eaton's geological text-book, he desires first to show what sort of provocation General Van Renselaer and professor Silliman have received from him; that the nature of their motives may be surmised, if possible, for the attack to which this communication is an answer. The only allusion in the article to the former of these two gentlemen, is contained in the following passage, at page 482, of the N. A. Review.

" We have read his [Eaton's] works, and continue to witness, with surprise, his pertinacious adherence to an arrangement of rocks, and a nomenclature, entirely at variance with nature and perspicuity. If Mr. Eaton had, in a modest, unpretending manner, brought the geological facts he had from time to time collected in the State of New York, into the general stock of practical information, he would have deserved and received unqualified praise. But presuming upon the supposed ignorance of his readers, he has preferred to set himself up for a genius. In this he has most lamentably failed; has greatly injured a cause he seems to be zealous in, and has abused the rare opportunities he has had of doing good, through the favour of the generous individual who has been his patron."*

In relation to the second of these gentlemen, the only passage where his name is mentioned, or where he is alluded to in any part of the article, is the following:

" We notice, however, with pleasure, an increasing attention to the study of natural history, in our principal colleges; and we are particularly happy in rendering justice to the persevering

* General Van Renselaer.

zeal and talents of Professor Silliman. Considering the many difficulties he has had to contend with, and the vigour with which he has kept the flag of science flying for so many years, we can say, with all our hearts, that we believe he will be as gratefully remembered hereafter for his public zeal, as he is now cherished for his private worth." If the writer has made palpable mistakes in any of the passages of that article, he knows where to lay his finger upon them.

The manner of General Van Renselaer's attack, is, as has been stated, unexpected. Either that gentleman has become an admirer of the casuistical tricks of hacknied disputants, or, what is more probable, he has never read Mr. Eaton's geological textbook, nor the review of it. Had he done so, he could not have descended to an affected candour, and have seriously proposed, that the writer should have examined "professor Eaton's views with a little better spirit, and *point out and correct* the supposed errors." Had he read those pages, he would have seen that this had been most justly and rigorously done, and that in no instance had the writer given into the base practice of attempting to injure Mr. Eaton's reputation by inuendo; but that in almost every instance, the reprehended passages were quoted at full length, or referred to. It would be as well for that gentleman too, to know that Mr. Eaton in his preface to this very work, says, "*I beg the favour of the most rigorous criticism on this book, small as it is.*" Severe as the article may appear, the terms "most rigorous" by no means belong to it, as could be most easily shown, if it should become indispensably necessary to recast it.

Under all the circumstances of the case, it cannot but be felt as a very difficult task, to satisfy General Van Renselaer, that he has taken a wrong view of this matter. In his note, he candidly says, "I am not a geologist myself." Now none but a geologist can be made to comprehend how futile Mr. Eaton's labours have been. What is to be done? Why do men complain of refutations not satisfying them, when they won't read them? Mr. Eaton seems to be satisfied; like good old Dogberry, finding there is no remedy, he is willing to be written down without making any fuss about it. Notwithstanding what General Van R. says of "the assurances of many of our distinguished scientific men," it may be asserted without fear of contradiction, that there is not an unbiased geologist in this country,—and it is a matter of considerable

importance in the question—who does not know that Mr. Eaton's efforts have been a failure ; and that it is so considered, both at home and abroad. That Mr. Eaton may have shown zeal in the service of his employer, has not been denied ; and that he has made us acquainted with the localities of many rocks, is 'true : but this, as a branch of geology, is a merit of the lowest order, and more than counterbalanced by the gross errors of his arrangements, and the nonsensical rhapsodies of his nomenclature. These have been repeatedly exposed in Europe, and the proofs of this were given, in the article complained of. Let any one compare his "Synopsis of North American Rocks and Detritus," in Silliman's Journal, Vol. XIV. page 145, with the tabular view of De la Beche, the approved result of the labours of the first geologists of the age—let them see the confusion he has introduced into the order of rocks, and the effrontery with which he has placed rocks in his American Synopsis, which neither he, nor any other individual ever saw on this continent, as in the case of his "lias :" the creation of three graywackes—his making basalt superincumbent to his third graywacke, when he does not even pretend he ever saw it there ; and that silly division of the superficial soil, into six formations, with Greek terminations ; let all this nonsense be seen and understood, and not one word more will ever be said about Mr. Eaton's geology.

But leaving this scientific method of treating the subject, the attention of General Van Renselaer is asked to the following illustration. Geology, as far as the order of succession of rocks is concerned, resembles our alphabet, the letters of which follow each other in a definite order. A—taking the column in the descending order,—being always at the top, where the superficial diluvium is usually found, and Z being always at the bottom, where granite and the primitive rocks are always found. The intermediate letters are also immovable as to the order of succession, M always preceding N, and S never preceding R : so it is with the intermediate rocks. Now the order and forms of our letters, are derived from those of the Roman alphabet—those from the Greek, and these last from the Phœnician and Hebrew ; so that every letter in our alphabet is a simple or compound copy of a Hebrew letter, as every rock on this continent has its equivalent in Europe, both as to mineral structure, and place in the series. An individual is now to be supposed, who has heard of

this affinity of languages, but who is ignorant of the Hebrew. He must be endowed with impudence, to pretend to teach it, and credulous people must be found to employ him. Let him possess a Hebrew bible, without an arranged alphabet. In his attempt to make out the order of the alphabet, such an individual, relying upon approximating resemblances, and ignorant of the elementary principles of graphic language, will proceed altogether by guess, and where the resemblances are doubtful, will make frequent mistakes—placing n, before m, S, before R, &c. &c., and knowing there are twenty-four letters in the English tongue, and ignorant that there are not so many by one-third, in the older languages, he will think the varying forms of the same letter, are different letters, and will swell the number of the letters of the oriental alphabet, to that of his vernacular tongue. This Mr. Eaton has done for geology. Unacquainted with the European types, except through the most deceptive of all things, hand specimens; and thinking all the rocks in Europe were probably to be found in the State of New York, he has not only put rocks out of their place in the series, but has swelled his imaginary column by introducing the lias, in a country where the whole oolitic system is wanting; and this, where there was not the least approximation, either in mineral structure, or organic remains. It is greatly to be regretted it is so, but this is the truth. When it is considered that Mr. Eaton boasts of having taught such a defective system—to say nothing of his universally rejected nomenclature—to seven thousand pupils, it is by no means a harsh thing to say of him, that “he has injured a cause he seems to be zealous in, and has abused the rare opportunities he has had of doing good.” But these glaring demerits, though often the subject of conversation among scientific men, were indulgently overlooked; it was hoped experience would have its usual effect. This was a vain hope; the appearance of “the geological text-book,” made further forbearance almost criminal.

As this answer to the attack upon Mr. Eaton's reviewer, will probably be looked into, by those who would seem not to have read the article in the N. A. Review, or to have seen its references in vain, the writer of the article “Geology” reluctantly, and in his own defence, once more cites a few passages, from the Review, and the “Geological Text-book.”

"I beg the favour of the most rigorous criticism upon this book, small as it is."—*Preface*.

"Should these observations ever fall under his notice, it may be well that he should remember this invitation."—*Review*.

"If the earth was washed and the rocks left clean, they (geologists) would not disagree in regard to rocks."—*Preface*.

"For ourselves, we can only say, that were the earth washed as clean as a penny, we should be very much tempted to take up our hammer and chisel, and try what we could find within its rocks: for, although Mr. Eaton may not know it, it is a fundamental principle of the science, to identify rocks by their organic remains, rather than by their mineral characters, which are very fallible guides."—*Review*.

"To stimulate men of science to the work of examination, and of criticism, I will state, that I intend to publish *considerable* in scientific journals; also, a full system upon this plan."—*Preface*.

"We love variety, and a full system, after the empty one before us, will be an agreeable change."—*Review*.

"Mr. Eaton has a habit of making confessions, which are not to his credit, and of which we do not see the motive. He says, 'I may be accused of fickleness on account of the changes which appear in every successive book I publish; I confess, this is the ninth time I have published a geological nomenclature, and that I made changes in each, of more or less importance.' Again, 'the various deposits of detritus had not been thoroughly studied by any American, when I published my last nomenclature. I believe I have made a few changes in that department, which will finally obtain.' 'On this head, we must venture to differ from him in opinion. We greatly doubt whether any of his opinions will obtain.'"—*Review*.

"The following passage is remarkable for its novel orthography, and also for its tone in regard to one of the most learned and philosophic men of the age, to whose labours Geology has been indebted in the highest degree." We allude to Henry de la Beche.

"With all *difference* to the high character of *La Bache*, as an experienced teacher, I may say, that his numerous sub-divisions, if adopted, *will ruin the science*."

"We would suggest to Mr. Eaton, that Mr. de la Beche's sub-divisions, are the result of a careful examination of all the geo-

logical beds, effected by the joint labours of the most enlightened geologists of Europe. The establishment of the series in this detailed manner, is the perfection of human industry and science, and is the true philosophical key to the mineral and organic structure of the earth. And here we have *an experienced teacher*, who does not know how to spell his native tongue, and whose geological information is limited to a few rocks in the State of New-York, stating, that Mr. de la Beche will *ruin the science*, for no other reason, that we can imagine, but to exclude from public notice, every work upon the subject, except his own."—*Reviewer*.

"The only geological fact in this work, which is absolutely new to us, is contained in the following passage.

"He, (Werner,) closed his long life in the full splendour of his scientific glory, in the same year (1817) in which *we* begun to make our humble efforts in the application of his views to American earth."

"Werner was singularly happy in two things; one, that he did not outlive his reputation; the other, that he died before Mr. Eaton applied his views to American earth." A few lines afterwards, he says, "Scarcely had that earth received his (Werner's) manes, &c." "We would suggest to Mr. Eaton, that *manes* and *remains*, however similar in sound, do not mean the same thing."—*Review*.

The writer in the North American Review, does not wish further to encumber the pages of the Monthly Journal of Geology and Natural Science, by quotations from the article in question. There are certain passages alluded to, which bring Mr. Eaton's want of fair dealing into a conspicuous point of view; and others, as at page 488, which are ridiculously amusing. Nothing can be more gross than his blunders, when he ventures to talk about organic remains, a branch of Geology he is entirely ignorant of. Thus, at page 51, he says, "But immediately over the carboniferous slate (coal measures) we find oviparous vertebral animals. I have before me the relics of a *crotalus* (rattle snake,) found by Dr. Rose, of Montrose, Pennsylvania. Hence, we infer, that oviparous vertebral animals were created soon after the bituminous coal deposites were made." The palpable absurdity of this assertion was exposed by the Reviewer. Every geologist knows that all the reptiles belonging to the ophidia, are exclusively of the present order of nature, and that a man might as well say

he had found a petrified roll of butter with the maker's name upon it, in a formation of that period, as a snake of any kind. Not convinced, he ventured, in a subsequent number of Silliman's Journal, to publish a lithographic plate of it, when it turned out to be one of the commonest fossil coal plants.

Gen. Van Renselaer having supposed Dr. Buckland to speak in an approving manner of Mr. Eaton's labours, it may not be amiss, by way of answer, to quote the following bombastic passage from page 14 of the "Geological Text Book."

"Since that time, Buckland, aided by the veteran Cuvier, has commanded the whole geological phalanx to leave, for a while, the deep abode of rocks, and to examine 'the open caverns and the furrowed earth.' He has led out before us, from the cave of Kirkdale, the *antediluvial mastodon*, chased and gnawed by hundreds of hyenas. He has shown us the torrid abodes of the river horse and the elephant, to have been in the latitudes of Caledonia and Scythia, &c. &c."

The opening of the cave of Kirkdale, when discovered, was about two feet wide in a solid rock. The adult mastodons were from ten to twelve feet high, so that it was impossible for any animal of that genus, young or old, ever to get in, or get out of such a cave, which was a mere den where hyenas brought the bones of dead animals. *But Dr. Buckland never found even any fragment of a bone of the mastodon in that cave.* It is evident, Mr. Eaton never read Dr. Buckland's book, or he would not have made an assertion so easily exposed. Are we to suppose that Dr. Buckland, one of the first minds in Europe, has lost his judgment, and can approve of such stuff?

But Gen. Van Renselaer says, "I am perfectly satisfied with Professor Eaton's labours."

And Mr. Silliman coming forward in his editorial capacity, to the defence of Mr. Eaton, says, "it is less an act of courtesy than of justice" on his part. If these gentlemen are satisfied to take such trash for Geology, it is very certain that the world at large will not be so. This is an intelligent age, and will stand by any writer who fearlessly speaks the truth, and diligently labours to prevent quackery and pretension from degrading the minds of the rising generation."

REMARKS.

The Editor of the American Journal of Science and Arts, having thought proper to throw his weight into the scale against the critic in the North American Review, whose answer now appears, we shall also enter the arena, and declare that our opinion differs from that expressed by him, *toto cœlo*. We do not see why it was necessary to designate the courtesy due to a distinguished gentleman, "less an act of courtesy than of justice" to Mr. Eaton. Finding him thus self-constituted a party to the dispute, we were not surprised at the eulogium he subsequently passes upon Mr. Eaton. The defence set up for him, when it is asserted, "that with respect to theory and nomenclature, there is room both for fancy and error," is no small encouragement to the Eaton school, which is thus assured of a comfortable corner, to take a nap in, after their labours. When a new nomenclature for chemistry, shall be proposed by some future inspired village pedagogue, that will be done for chemical dynamics, which Mr. Eaton has attempted to do for geology. The minds of ingenuous young men, will be enfeebled and obscured, in the vain attempt to draw from a mass of trashy ignorance, some particle of useful knowledge, some beam of pleasant philosophy. We will not enter into this criminal conspiracy against the powers of the human mind. When our columns shall cease to exhibit science as it results from facts, learning without pedantry, and the divine feelings of religion, without the cant of the old Pharisees, our undertaking will be at an end. Sir James Mackintosh, in his able account of the rise and progress of the reformation, has said of "all those who oppose hinderances to free, fearless, calm, unprejudiced and dispassionate inquiry," that "they lessen the stores of knowledge, they relax the vigour of every intellectual effort, they abate the chances of future discovery." We lay our account in meeting with much opposition, from men of this class. But our object is not to win opinions from a limited number of selfish individuals, more interested in humbugging the public, than in enlightening it. We stand up for truth and justice; our aim is to instruct and amuse the millions—these are the "munificent patrons" we look to for approbation.

We have been unwillingly forced into these remarks; if it should be necessary to recur to the subject, we inform those concerned, that we mean to do it, *con amore.*

EDITOR.

ANECDOTES OF NATURAL HISTORY.

“N. K.” System of Arrangement.—A naturalist, travelling in the interior of Pennsylvania, stopped at a very neat, clean tavern, and was agreeably surprised to find the chimney-pieces, cupboards, &c., crowded with specimens of minerals and fossils, each of them having a label with N. K. on it. Puzzled by these letters, he sought for information of a smart-looking woman, who was the landlady. She informed him that her nephew, who was gone to Kentucky, was the owner of these specimens, and that he had pasted some long names upon them, he had learnt from the doctors in Philadelphia ; but they were so hard to pronounce when her neighbours asked her questions about them, that she had taken them off, and had put N. K. upon every one of them. The naturalist assenting to all this, asked her the meaning of N. K. “ So, you don’t know what the meaning of N. K. is ? ” said she. “ Upon my word, I have not the least idea,” he replied. “ Well,” said she, “ I thought the Philadelphians knowed every thing ; however, if you don’t know, I’ll tell you : N. K. means ‘ Nayterul Kurossitys.’ ”

A Case where the Specimens required no Labels of Locality.—It is stated in the memoirs of Sir Stamford Raffles, that Dr. Horsfield, during a tour in Sumatra, having given the geological specimens he had collected to his coolies to carry, wished to examine them after the day’s journey. The Doctor seeing their baskets full of other stones than those he had given to them, expressed himself angrily ; when they very simply stated, that seeing he was anxious to collect stones, they, preferring to travel with empty baskets, had thrown those he gave them away, and had filled their baskets again at the end of their day’s journey.

Preparations to receive a Royal Naturalist, by the Lord of the Castle of Rabenstein, in Franconia.—Dr. Buckland has fully described the cave of Kühloch, in Franconia, in his *Reliquiæ Diluvianæ*, page 137, et seq. In 1829, two English geologists, Mr. Egerton and Lord Cole, being on a scientific tour in Germany, paid a visit to that ancient deposit of the remains of extinct animals. The following extract of a letter from Mr. Egerton to Dr. Buckland, will tell the melancholy story of this second punitive visitation upon the mammifera within the dominions of the Lord of the castle of Rabenstein.

Schaffhausen June 26, 1829.

My dear Sir,—Lord Cole and myself are just returned to Schaffhausen, from a three weeks' visit to the caverns of Franconia; and knowing the great interest you feel in their welfare, I write to inform you of the melancholy fact of the total destruction of the deposit of bones in the caves of Kühloch and Rabenstein. His Majesty, the king of Bavaria, having announced his intention to visit Rabenstein, the owner of that castle has thought fit to prepare these two caves for his reception; in order to do which, he has *broken up the whole of the floors, pounding the larger stones and bones* to the bottom, for a foundation, and spreading the earth, and finer particles, to form a smooth surface over them. *Conceive our horror* on arriving at Kühloch, at finding thirty men at work, wheeling out the *animal* earth*, to level the inclination of the entrance, by which you have so satisfactorily explained the phenomenon of the absence of pebbles and diluvial loam, in this remarkable cavern. There was not a bone to be found there when we arrived; however, with a little management, we contrived to obtain two beautiful fragments of lower jaws of hyena, besides some very good bears' bones, and one ulna that had been broken during the animal's life, and the sharp edges of the fracture rounded off by the absorbents into a smooth stump. We likewise procured from one of the workmen, teeth of a fox, of a tiger, and a molar tooth of the right lower jaw of Rhinoceros—all of which he said he picked up in Kühlock."—*Philosophical Magazine and Annals of Philosophy*.

THE following anecdote has been communicated to the editor by a gentleman of distinguished standing at Washington, who is a very curious observer. This defensive faculty of a well known insect, is a new discovery, and the attention of some naturalists will probably be drawn to it.

"Walking on the back piazza, I noticed that one of the lightning bugs, had become entangled in a spider's web. The spider instantly attacked him, and endeavoured to secure his wings. The bug emitted his light very rapidly, the spider alternately attacking and retreating, until at length it appeared distressed, and sustained itself upon the web with difficulty, staggering and tum-

* The presence of such quantities of this animal earth, made this cave particularly interesting to naturalists, as it consisted of broken down animal matter.

bling in its last retreat from the contest, until it gained the wall, against which it rubbed itself, as if to remove some offensive matter from its body. It appeared to experience great difficulty in retaining its hold on the wall, from which it frequently fell, suspended by one limb. At length it appeared to recover, and remained quiet. In the mean time, the bug ceased struggling, and merely emitted its light; the web soon gave way, and it escaped. These facts were observed by me with great interest, and occurred as I have represented them."

Case of a Bee, Self-decapitated.—WE paid a very interesting visit a short time ago, to a gentleman, who is a keen observer of nature, and whose great experience in apiaries has not only been productive of much curious information, relating to the economy of bees, but which has been directly useful to numerous persons, who maintain apiaries, in order to supply our markets with honey. This anecdote was related to us, whilst examining his well constructed hives.

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"A large humble-bee, strayed near to one of his hives, and alighted near the entrance. Instantly he was attacked by great numbers of bees. One of them, seeking a favourable opportunity of lodging his sting under one of the rings of the humble-bee, made a fierce blow: but the sting striking upon the hard and bright corslet, glanced off; and as it is the habit of the bee in the act of striking, to bend the head towards the tail, the sting, upon this occasion, entered deeply into its own head. After many powerful exertions to extricate it, at length the entire head came off, and remained attached to the tail. The insect now gravely with its feelers, began to paw about his neck, as if to examine the nature of the accident which had occurred to it, spinning round, and feeling, and then stopping for awhile. In about twenty minutes the insect was exhausted and died.

The Rattle-snake.—Dr. Harlan exhibited the following experiment to Capt. Basil Hall, and some gentlemen. He severed the head from a rattle-snake, and afterwards grasping the part of the neck adhering to the head, with his thumb and finger, the head twisted itself by violent movements, and endeavoured to strike him with its fangs. Afterwards, a live rabbit was presented to the head, which immediately plunged its fangs into the rabbit very deep. Dr. H. then asked Capt. Hall to take hold of the

tail, which he had no sooner done, than the headless neck bent itself quickly round as if to strike him. This last movement may be attributed to muscular habit.

EVERY lover of nature will be touched with the eloquence of the following passage from the journal of a Naturalist.

“The little excursions of the naturalist, from habit and from acquirement, become a scene of constant observation and remark. The insect that crawls, the note of the bird, the plant that flowers, or the vernal green leaf that peeps out, engages his attention, is recognized as an intimate, or noted from some novelty that it presents in sound or aspect. Every season has its peculiar product, and is pleasing or admirable, from causes that variously affect our different temperaments or dispositions; but there are accompaniments in an autumnal morning’s walk, that call for all our notice and admiration: the peculiar feeling of the air, and the solemn grandeur of the scene around us, dispose the mind to contemplation and remark; there is a silence in which we hear every thing, a beauty that will be observed. The stump of an old oak is a very landscape, with rugged alpine steeps bursting through forests of verdant mosses, with some pale, denuded, branchless lichen, like a scathed oak, creeping up the sides, or crowning the summit. Rambling with unfettered grace, the tendrils of the briony (*tamis communis*) festoon with their brilliant berries, green, yellow, red, the slender sprigs of the hazel, or the thorn; it ornaments their plainness, and receives a support its own feebleness denies. The agaric, with all its hues, its shades, its elegant variety of forms, expands its cone, sprinkled with the freshness of the morning; a transient fair, a child of decay, that “sprang up in a night, and will perish in a night.” The squirrel, agile with life and timidity, gamboling round the root of an ancient beech, its base overgrown with the dew-berry, (*rubus cœsius*), blue with unsullied fruit; impeded in its frolic sports, half angry, darts up the silvery bole again, to peep and wonder at the strange intruder on his haunts. The jay springs up, and screaming, tells of danger to her brood; the noisy tribe repeat the call, are hushed, and leave us; the loud laugh of the wood-pecker, joyous and vacant, the hammering of the nuthatch, (*sitta europœa*) cleaving its prize in the chink of some dry bough,” &c.

TO READERS AND CORRESPONDENTS.

We are indebted to a friend for pointing out to us, almost at the moment of closing our number, an *ex parte* statement, which the committee on publications of the Franklin Institute have inserted at page 7 of their Journal for July, 1831. This statement, made by one of their members, and on a subject very foreign to the useful arts, is directed against an individual who is not a member of their society, and who, never doubting of such an attack, was precluded from the refutation of it, either by himself or his friends. That Journal having thus, by the act of the committee, become the vehicle of defamation in its most insidious form, it has become necessary to notice so unexpected a departure from propriety on the part of the committee. That the members of the Franklin Institute may understand how little we have deserved such unjust treatment from their society—for it is the editor of this journal who is falsely accused of having attacked the reputation of their deceased member Dr. Godman,—we proceed to state: that it was our good fortune to make publicly known for the first time, a beautiful and useful invention of Mr. John Price Wetherill, to create flame in the combustion of anthracite coal. As the public caught rapidly at this valuable improvement, we agreed with Mr. W. to make it more extensively known, and to insert a paper with appropriate plans concerning it, in the first number of this Journal. When the preparations were about completed, Dr. Isaac Hays took an opportunity of requesting the editor not to insert the plans, &c. of Mr. W.'s furnace, stating, that it might seriously injure the circulation of the Journal of the Franklin Institute, if the Monthly American Journal, were also to draw upon that branch of natural science for support. We told him without hesitation, that our respect for the founders and supporters of the Franklin Institute was unfeigned, that we should upon all occasions give it our entire and unequivocal support; and that, if it was the wish of the society to avail itself of Mr. W.'s invention, we would cheerfully withdraw our paper, and release Mr. W. from his agreement with us. We accordingly called upon Mr. Wetherill the same day, explained to him what had passed, and requested him to transfer his drawings to the use of the Franklin Institute. We regret having done so—we have, from generous motives, been the cause of their being withheld from the public, and have received but a sorry return for our kindness. Our good wishes, however, for the success of the Franklin Institute are not abated; and whilst we are surprised at the authorized publication of what was intended to injure us, we would by no means revenge upon the interests of a valuable society, the act of one of the most insignificant of their members. We know how difficult it is for a numerous society to prevent an intriguing, pharisaical individual from committing them occasionally.

As to Dr. Isaac Hays' statement, as found at page 7, we have only room to say, we shall hereafter show it is a *deliberate falsehood* from the beginning to the end. We have been strongly solicited to expose the previous moral obliquities of that mendacious little individual, and we have hitherto withheld our hand. But all consideration for him is now at an end. We cannot be silent when low contrivances, aiming to bring us into discredit, and to impair our usefulness, are resorted to, for no purpose but to bring into notice a parasite who lives by dishonouring the labours of others.

The promised paper on Big bone lick, has, for reasons beyond our controul, been delayed until the next number.

It is very true, as our correspondent G. observes, that we were in possession of his paper in season for our first number. Our answer is, that when papers equally meritorious come into our possession at the same time, the editor must claim the privilege of selection, and that his preference may be governed by considerations, it would be quite inexpedient to enter into with every correspondent. It is of importance that the contents of the Journal should be various.

The three interesting papers on the origin of the Indian languages of this continent are under consideration.

We hope soon to have an interview with the distinguished naturalist, who has favoured us with a paper on "the domestic animals of the Indians of this continent."

The editor will transmit a note to Rusticus, if he will leave his address at the Literary Rooms.

The plate of this number, representing fragments of the jaw and teeth of the *Megalonyx laqueatus*, should have been numbered III.

 In a few copies of this number, the asterisk on page 55 is misplaced. It refers to the period of Herodotus, in the line below where it stands.